

REMARKS

Claims 7-9 and 11 are pending in the present application. Claim 7 is herein amended.
Claims 1-5 and 10 are herein cancelled. No new matter has been entered.

Rejections under 35 USC §103(a)

Claims 1-5 were rejected under 35 USC §103(a) as being obvious over Yoshimura et al. (Quasicrystal Application on Catalyst).

By this amendment, claims 1-5 have been cancelled. Thus, that the rejection now has become moot.

Claims 7, 8 and 11 were rejected under 35 USC §103(a) as being obvious over Yoshimura et al. (Quasicrystal Application on Catalyst).

Claims 10 was rejected under 35 USC §103(a) as being obvious over Yoshimura et al. (Quasicrystal Application on Catalyst) as applied to claim 7 above, and further in view of Moriga et al. (JP 2-233501).

These rejections are addressed here together because the recitation of claim 10 is incorporated into claim 7 cancelling claim 10.

Regarding method claims 7-11, responding to Applicants' previous response, the Examiner also alleged as follows:

Applicant's arguments regarding the 103 rejection over Yoshimura towards claims 7, 8, and 11 are not persuasive as Yoshimura teaches the final prepared catalyst powder to have copper oxide particles sitting on the surface as discussed above.

Yoshimura does not teach a heat treatment to oxidize the Cu to CuO, however there is CuO present. One of ordinary skill at the time of the invention would find it obvious to use a heat treatment in an oxidizing atmosphere to produce CuO from Cu particles.

(Office Action, page 8, lines 6-19).

However, the allegation is not based on the fact. According to Yoshimura, the samples are **reduced in a hydrogen atmosphere** at 523 K before reaction. Such a disclosure in Yoshimura clearly **teaches away** from performing a heat treatment of the leached Al alloy particles in an oxidizing atmosphere.

Moreover, claim 7 has been amended to recite, “performing heat treatment of the leached Al alloy particles in an oxidizing atmosphere so that substantially all of the fine Cu particles are converted into fine copper oxide particles.” Thus, in the catalyst of the present invention, substantially all of the fine Cu particles contained in the oxide surface layer are converted into the fine copper oxide particles.

In contrast, according to Yoshimura et al., the sample powders are reduced after the leaching before the reaction. Therefore, the fine Cu particles contained in the oxide surface layer are mostly of Cu metal rather than converted into copper oxide.

Due to the differences, there are significant differences in the effect of the catalyst. For example, Figs. 2 and 3 in Yoshimura et al. show the rate of hydrogen production against reaction temperature in steam reforming of methanol using the catalysts. The charts do not show the data at temperatures of less than 500°C. Despite the general tendency that the rate of hydrogen production increases with the rise of temperature, Figs 2 and 3 in Yoshimura et al. show the rates of hydrogen production as low as 150 ml/g·min or less at about 510°C. In contrast, Figs. 5-8 of

the present application show the rates of hydrogen production as high as 400 ml/g-min or more at about 360°C which is obtained using the catalyst of the present invention. Such results are not expected from Yoshimura et al.

Moreover, claim 7 has been further amended to recite “performing leaching treatment for the Al alloy particles with an aqueous alkaline solution containing one of sodium hydroxide (NaOH), sodium carbonate (Na_2CO_3), and sodium hydrogen carbonate (NaHCO_3), wherein the concentration and the temperature thereof are adjusted in the range of 2 to 15 percent by weight and in the range of 0 to 90 °C respectively, to form oxide surface layers, which contain fine Cu particles dispersed therein and which are composed of an Al oxide and a transition metal oxide, on surfaces of the Al alloy particles,” incorporating the recitations of previous claim 10. The amendments are supported in the original specification, for example, at page 22, last line to page 23, line 7, and page 23, lines 13-17.

In Yoshimura et al., aqueous solution of 20 wt% NaOH is used. The concentration is much higher than that claimed in the present invention. Although Moriga et al. is cited for allegedly disclosing leaching the alloy in an aqueous alkaline solution of 1-40% NaOH, the solution is used to leach Al-Cu alloy which is not pulverized. Therefore, the use of the alkaline solution is different. Moreover, such disclosure of Moriga et al. does not remedy the other deficiencies of Yoshimura et al. discussed above.

For at least these reasons, claim 7 patentably distinguishes over Yoshimura et al. Claims 8 and 11, depending from claim 7, also patentably distinguish over Yoshimura et al. for at least the same reasons.

Claim 9 was rejected under 35 USC §103(a) as being obvious over Yoshimura et al. (Quasicrystal Application on Catalyst) as applied to claim 7 above, and further in view of Kazuhito et al. (JP 03-238049).

Claim 9 depends from claim 7, which patentably distinguishes over Yoshimura et al. Kazuhito et al. is cited for allegedly disclosing a methanol reforming catalyst consisting Cu, Zn and Al is leached in an alkali solution of 30-60°. However, such disclosure of Kazuhito et al. does not remedy the deficiencies of Yoshimura et al. discussed above.

For at least these reasons, claim 9 patentably distinguishes over Yoshimura et al. and Kazuhito et al.

The following table shows the comparison between the present invention and Yoshimura et al.

| Claim 7 | Yoshimura et al. |
|---|--|
| <p>pulverizing a bulky Al alloy having a quasicrystalline phase or a related crystalline phase thereof, the quasicrystalline phase being represented by the formula: $Al_{100-y-z}Cu_yTM_z$, where y is in the range of 10 to 30 atomic percent, z is in the range of 5 to 20 atomic percent, and TM indicates at least one of transition metals other than Cu,</p> | <p>A nominal alloy of stable quasicrystal $Al_{63}Cu_{25}TM_{12}$ with TM of Fe, Ru, Os and other Al-Cu-Fe alloys were prepared from pure elements with purities of 99.9 wt.% Al, 99.9 wt.% Cu, 99.9 wt.% Fe, 99.9 wt.% Ru, 99.9 wt.% Os, in an arc furnace in argon atmosphere. The alloys were wrapped in Mo film and then encapsulated in an evacuated quartz tube with an argon atmosphere, and subsequently annealed at 1073 K for 6 h.</p> <p>The annealed alloys were crushed to particle sizes of interest in a ballmill.</p> |
| <p>performing leaching treatment for the Al alloy particles with an aqueous alkaline solution <u>containing one of sodium hydroxide (NaOH), sodium carbonate (Na_2CO_3), and sodium hydrogen carbonate ($NaHCO_3$), wherein the concentration and the temperature thereof are adjusted in the range of 2 to 15 percent by weight and in the range of 0 to 90 °C respectively,</u> to form oxide surface layers, which contain fine Cu particles dispersed therein and which are composed of an Al oxide and a transition metal oxide, on surfaces of the Al alloy particles</p> | <p>The sample powders were leached in 20 wt.% NaOH aqueous solution, kept in the solution for 12 h, and then they were filtered out and thoroughly washed with distilled water until no was detected in the filtrate.</p> |
| <p>performing a heat treatment of the leached Al alloy particles in an oxidizing atmosphere so that <u>substantially all</u> of the fine Cu particles contained in the oxide surface layer are converted into the fine copper oxide particles.</p> | <p>The steam reforming of methanol experiments were carried out in a conventional flow reactor at 100 kPa. The samples were reduced in a hydrogen atmosphere at 523 K before reaction.</p> |

In view of the aforementioned amendments and accompanying remarks, Applicants submit that the claims, as herein amended, are in condition for allowance. Applicants request such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,
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